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Emotional Expressions Related to Reversal Coordination Psychological Mechanisms

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Abstract

Examine the psychological mechanisms generated by reversal coordination behaviors related to different emotional expressions.

Methods: 32 college students were tested to complete reversal learning tasks related to different expressions.

Results: Reaction time of reversal task is evidently higher than reaction time of repetitive task ($F(1, 31) = 4.59$, $P < 0.05$), while accuracy rate of reversal task is evidently lower than accuracy rate of repetitive task ($F(1, 31) = 8.73$, $P < 0.05$). Reversal task reaction time of angry face is higher than that of happy, sad, and neutral face ($F(3, 93) = 4.92$, $P < 0.05$), while the accuracy rate is lower than that of happy, sad, and neutral face ($F(3,93) = 10.10$, $P < 0.05$).

Conclusion: Angry expression related reversal coordination behavior is harder than happy expression and sad expression related reversal coordination behavior, demonstrating that reversal coordination behavior of college students is associated with threat information alertness formed in long-term evolution.

Key words: Switch; Reversal learning; Adaptation mechanism

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INTRODUCTION

In social interaction, changes of facial expressions are rapid and natural. Individuals can guess human social behaviors relying on changes of facial expressions. Therefore, facial expressions are important clues to coordinate human social behaviors. Effective facial expression coordination depends on the individual's effective identification of the facial expressions of others and the ability to coordinate self behavior based on the facial expressions obtained (Rolls, 1999). At present, there are a lot of researchers studying on individual effective facial expression identification ability and neural basis (Adolphs, 2002). Yet, only a few concentrate on individual's ability to coordinate self behavior based on facial expressions obtained (Kringebach and Rolls, 2003).

"Reversal Learning Task Paradigm" can examine how individual regulate subsequent social behavior based on external information (Robinson et al.2010; Will et al.2010). This paradigm includes two kinds of processing processes to examine the two abilities of individual as below: the ability to accept minor changes in the social environment (learning ability), and the ability to adjust self behavior based on these minor changes (reversal ability) (Rolls, 1999). Once the experiment is started, testee will see two neutral faces on the computer screen, and be requested to guess which of the faces is going to turn to a happy face. This process reflects the ability of recognize faces. When continued for four to eight correct reactions, the original sustained happy expression face will no longer be associated with happy expression. At this time, reversal is generated, indicating individual needs to adjust the original reaction. This process reflects the ability of reversal coordination.

Previous studies on reversal coordination discovered that there are differences in reversal features of individual to different potency stimuli, in presenting happy face connection reversal process and angry face connection reversal process. Separation starts at approximately

375ms when emotion face appears. Comparing the stimuli of individual turning to angry face connection with the stimuli of individual turning to happy face, P3a amplitude decreases, P3b incubation period delays (Kringebach and Rolls, 2003; Will et al.2010), indicating that it is harder for individual to reverse from angry face connection stimuli, while easier to reverse from happy connection stimuli. Through analysis on relevant studies, it is found that there are two possible reasons to cause this phenomenon: first is that individual forms alertness against threats in the process of evolution (Paulitzki et al.2008), second is that it is prevalent that individual has processing erroneous tendency against negative information. Studies on memory and attention discovered that that it is prevalent that individual has memorizing and paying attention erroneous tendency against negative information, namely individual memorizes more on negative information, and pays longer attention to negative information (Eastwood et al. 2001; Fox et al. 2001; Fox et al. 2002; Adolphs, 2002; Dai Qin, 2008; Willims, 2010; Naranjo et al. 2010).

To reveal the psychological reasons to cause this reversal phenomenon, the study uses reference from previous "Reversal Learning Task Paradigm", takes neutral face in place of angry or happy face in previous studies as clue to indicate reversal, and sets happy, angry, and sad face with neutral face respectively for reversal. Such design can enable researchers to effectively compare reversal differences in happy, angry, sad face with neutral face. If there is evident difference between individual angry expression related reversal task and happy, sad, neutral expression related reversal task, it indicates that alertness to threat information formed in individual evolution process is the reason for generating different expression related reversal difference. On the contrary, if there is evident difference between individual happy expression related reversal task and angry, sad, neutral expression related reversal task, it indicates that the psychological reason for the generation of reversal difference is individual has processing erroneous tendency against negative information.

1. METHODS AND MATERIALS

1.1 Testee

Testees are 32 college students. All testees are right-handed, with no mental disorder, and have normal vision or corrected visual acuity of 0.06 above. There is no difference in education level and age among the testees. All testees are recruited through advertising, and paid after the completion of the experiment.

1.2 Experiment Design

4(expression types: happy, angry, sad, and neutral) x 2(task nature: repetitive task, reversal task) within-subject design. Expression type and task nature are set as variables, while the accuracy rate and reaction time of testeee pressing key are set as dependent variables.

1.3 Experiment Tasks and Materials

Materials

52 neutral emotion photos are selected from China emotion photo gallery of Chinese Academy of Sciences, among which 48 are used in formal experiment while 4 are used in practice experiment. 33 emotion faces are selected from emotion face photo gallery of Chinese Academy of Sciences (11 sad faces, 11 angry faces, 11 happy faces, and 33 neutral faces), among which 9 sad faces, 9 angry faces, 9 happy faces, and 27 neutral faces are used in formal experiment while 2 sad faces, 2 angry faces, 2 happy faces, and 2 neutral faces are used in practice experiment.

Experiment Tasks

In each task, a 3000ms cross point of regard first appears, and then 1000ms two neutral photos appear in black background, with one face having yellow box above. It is requested that the testee predict the figure emotion triggered by photo under the yellow box. Whether the figure becomes happy, angry, or sad, depends on the personal feeling of the testee. The task of the testee is to possibly trace and predict certain type of mood. Press 1 for happy, press 2 for angry, press 3 for sad, and press 4 for neutral. Next, with 3000ms feedback, if the prediction of testee is correct, the photo will continue to present happy, angry, or sad expression in the following 5 to 8 trials. If the random feedback of the 5 to 8 trials turns to neutral expression, suggest the testee later trace neutral expression. Yet, the feedback may be invalid feedback, if the testee predicts correctly. The figure presents neutral mood. Under such condition, the testee should insist on his prediction, and there is no need for reversal (refer picture 1). The ratio between invalid feedback and indication reversal is 20:80. There are 3 blocks in total (happy-neutral, angry-neutral, and sad-neutral reversal). Each reversal contains 5 to 8 trials. And each block has 7 switches.

1.4 Experiment Procedures

Testee sits in soundproof shield laboratory, looking at computer screen. Instructions appear in the center of the screen. The instructions are "when cross point of regard appears, please focus. Later, two photos will be shown horizontally, with one having yellow box on it. Please predict the expression next to the face, whether is it happy expression (angry expression, sad expression), or neutral expression. Press 1 for happy expression (2 for angry expression, 3 for sad expression), and 4 for neutral expression. Next is followed with feedback, indicating whether your reaction is correct. Please adjust your following reaction according to the feedback. Also note that 20% of the indications are incorrect. Now, let's get down to practice experiment". Then, 1000ms neutral

photos appear at the left and right sides of the screen. Testee press keys to show reaction upon the emergence of photo. Once reaction completes, two feedback photos will show up. The original yellow box photo turns to expression photo, while the other remains constant. The presence duration of the photo is 3000ms. In the experiment process, the reaction time and accuracy rate of the testee is recorded.

1.5 Data Analysis

Exclude reaction time over 1000ms and data under invalid indication condition. 32 testees remain. 4(expression types: happy, angry, sad, and neutral) x 2(task nature: repetitive task, reversal task) repetitive measurement two factors variance analysis is conducted upon the testees' average reaction time and accuracy rate.

1.6 Results Analysis

Average reaction time repetitive measurement variance analysis found that task nature ($F(1,31) = 4.59$, $P < 0.05$) has evident main effect. Expression type*task nature ($F(3,93) = 7.61$, $P < 0.05$) has evident interaction effects. Further simple effect analysis discovered that task nature has evident differences on happy expression ($F(1,31) = 6.43$, $P < 0.05$), angry expression ($F(1,31) = 10.33$, $P < 0.05$), and neutral expressions ($F(1, 31) = 8.54$, $P < 0.05$). Expression type has evident differences in repetitive task ($F(3,93) = 4.07$, $P < 0.05$) and reversal task ($P < 0.05$), embodying angry expression type higher than happy, sad, neutral expression type ($P < 0.05$). However, there is no evident difference between happy expression type and sad expression type ($P > 0.05$).

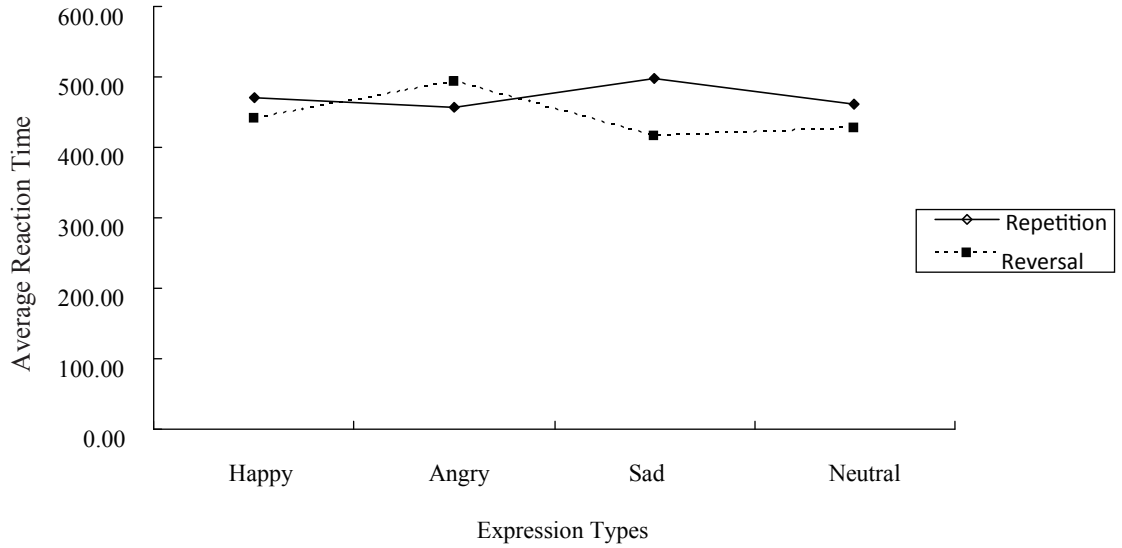

Figure 1
Interactions Between Expression Type and Task Nature

Average accuracy rate repetitive measurement variance analysis found that expression type ($F(3,93) = 14.29$, $P < 0.05$) has evident main effect, representing happy face accuracy rate significantly higher than angry face, sad face accuracy rate significantly lower than angry face, neutral face accuracy rate significantly higher than angry face and sad face. Task nature ($F(1,31) = 8.73$, $P < 0.05$) has evident main effect, representing accuracy rate under repetitive task condition higher than accuracy rate under reversal task condition. Expression type*task nature ($F(3,93) = 4.56$, $P < 0.05$) has evident interactions. Further simple effect analysis discovered that task nature has evident differences on happy expression ($F(1,31) = 14.62$, $P < 0.05$), angry expression ($F(1,31) = 10.73$, $P < 0.05$). Expression type has evident differences on repetitive task ($F(3,93) = 11.19$, $P < 0.05$) and reversal task ($F(3,93) = 10.10$, $P < 0.05$), embodying angry expression type lower than happy, sad, neutral expression type ($P < 0.05$). Nevertheless, there is no evident difference between happy expression type and sad expression type ($P > 0.05$).

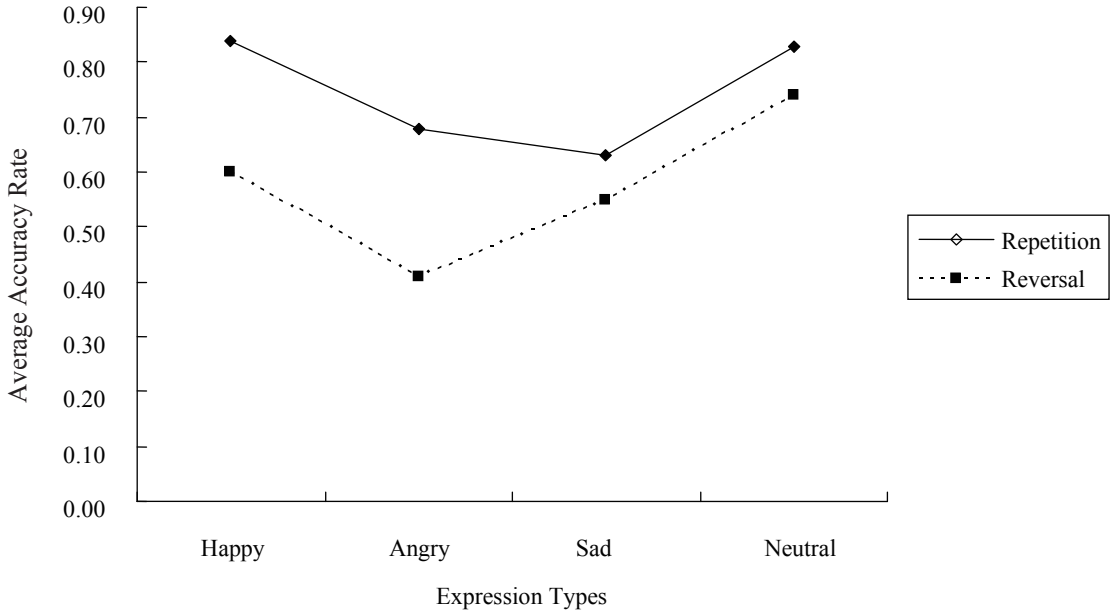

Figure 2
Interactions between Expression Type and Task Nature

1.7 Discussion

The study adopts modified reversal learning task paradigm to examine the psychological mechanisms generated by reversal coordination behaviors related to different emotional expressions. Results show that there are evident differences between angry expression related reversal task and happy, sad, neutral expression related reversal task, indicating that alertness to threat information formed in individual evolution process is the reason for the generation of different emotions related reversal differences.

The study discovered that reaction time of repetitive task is lower than that of reversal task, while accuracy rate of repetitive task is higher than that of reversal task. This demonstrates that evident switch payoff is generated when individual is conducting expression type switch (Qu & Zelazo, 2007; Leleua, et al .2010). There are evident interactions between expression type and task nature reaction time and accuracy rate, embodying task nature has evident difference in happy expression reversal, angry expression reversal and neutral expression reversal reaction time and accuracy rate, namely, happy expression reversal repetitive task reaction time is higher than reversal task, accuracy rate is higher than reversal task. There is evident reversal payoff in reaction time. Angry face reversal repetitive task reaction time is lower than reversal task, accuracy rate is higher than reversal task. Reversal payoff is manifested in reaction time and accuracy rate. This is similar to results of previous studies (Kringebach, 2003; Willis, 2010). Regardless it is reaction time or accuracy rate, angry expression type differs from happy, sad expression type. Yet, there is no evident difference between happy expression type and sad expression type (refer figure 2, 3). This reflects the reason that individual has poor reversal coordination ability towards angry information is the alertness against threat information generated in the long-term evolution process of individuals. It is not the generally present processing erroneous tendency towards negative information.

The study also has room for improvement. First, the study adopts neutral background photo as background contents in order to avoid the possible influence of background information upon judgment in later tasks. There is no direction link between background content and subsequent expression prediction. However, in interviews after experiment completion, a number of testees doubt whether this is certain relations between the two. In reality, individual predicts subsequent reactions upon present information given, prepares for later tasks, reduces reversal payoff, and improves task effectiveness. Future studies can combine relevant background information, to examine the influence of different background content on individual reversal behavior, distinguish the relations between background content and reversal. Second, neutral emotion photos are adopted as background information in this experiment. Yet, in the following part, the task of testee is emotion predition. In reality, excluding common background information, individual constantly adjusts his behavior depending on the different emotion changes of others. Therefore, future studies can take into consideration to change the background information to different facial expression, and request individual to trace certain specific facial expression, and examine the reversal ability of individual according to background emotion changes.

CONCLUSION

Thorough behavioral experiment, the study discusses the psychological mechanisms generated by reversal coordination behaviors related to different emotional expressions. Results show that the judgment reaction time of college students upon repetitive tasks is lower than that of reversal tasks, while the accuracy rate of repetitive tasks is higher than that of reversal tasks. There is reversal payoff. Reaction time upon threat face is higher that happy face and sad face, while the accuracy rate of threat face is lower than that of happy face and sad face, as individual holds higher alertness to threat information.

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